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REAL ESTATE

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Tracking the real estate energy transition

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The energy transition is an increasingly important trend for real estate investors, businesses and governments. However, a successful transition to a low carbon economy is dependant on many factors, each of which can drive forward our progress, or create challenges. Understanding how the major factors impacting the real estate energy transition are shifting allows investors to identify where these tailwinds and headwinds are present, or developing, to better understand how the overarching real estate energy transition is unfolding.

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Assessing key factors impacting the pace of transition

TRANSITION CONTINUES BUT PROGRESS LAGS

The pace of the transition is highly uncertain but one thing is clear: the megatrend towards a lower carbon economy is top of mind for the world's largest investors. Nearly 70% of Nuveen's 2025 EQuilibrium investor survey respondents are already taking account of net zero commitments in investment decisions, or planning to do so in the next 12 months. Investors continue to focus on sustainable buildings to alleviate the risk of stranded assets and because of a conviction that 'greener' buildings will be future-proofed and hold their value.

The global built environment has made considerable progress on decarbonisation in the past decade but is currently not on track to become net zero carbon by 2050. Buildings now contribute 34% of global CO_2 emissions and having reduced energy intensity by 9.5% since 2015. This reduction falls short of the 18.2% target that was deemed necessary over that time period.[1]

While the transition currently lags behind targets, investors should continue to incorporate an assessment of the net zero readiness of assets into decision making as the drivers towards lower carbon real estate are still present. This journey is not linear, and progress may ebb and flow, but the destination is clear. It is crucial to take a view on the pace of the future trajectory in different locations. This enables a judgement call on the level of carbon efficiency that the market will expect of buildings, a key factor in value preservation.

KEY OUTCOMES WILL NEED TO MATERIALISE FOR THE TRANSITION TO OCCUR

Realising a net zero carbon transition for the built environment will require critical objectives being met. Tracking indicators of progress towards these outcomes gives an idea of the pace of transition and if these goals are not reached, the transformation is unlikely to occur.

Indicators	Future outcome	Global	United States	Europe	Asia Pacific
1 Investor appetite	Investors will make allocation decisions based on meeting decarbonisation goals	NEUTRAL	🟡	🟢	🟡
2 Grid decarbonisation	Electricity grids in the regions that we invest will continue to decarbonise	NEUTRAL	🟡	🟢	🔴
3 Supportive supply chain	Supply chain dynamics in skills and construction costs will support the transition	BOTTLENECK	🔴	🔴	🔴
4 Cheaper technology	Technology to make buildings more energy efficient will continue to improve and to reduce in cost	ACCELERANT	🟢	🟢	🟢
5 Tightening regulation	Building regulations around energy and carbon efficiency will continue to strengthen	ACCELERANT	🟡	🟢	🟢
6 Occupier demand	Occupiers' net zero carbon goals will inform their space requirements	NEUTRAL	🟡	🟡	🟡

Each of these indicators is classified as an accelerant, bottleneck or neutral based on our assessment conducted in 2025. This determination reflects their current impact on the pace and progress of the transition but acknowledges that these classifications will evolve over time as market dynamics, policies and technologies change.

It is important to note that we have looked at these indicators through the lens of real estate investment and specifically in relation to the markets in which we invest.

REGIONAL VARIATION

The overall global picture is 'neutral' but there is considerable variability between the indicators and between the regions. Regulation and technology act as accelerants in most regions but supply chain dynamics and construction costs are significant bottlenecks across all three global regions. Investor appetite and grid decarbonisation are neutral overall but acting as accelerants in Europe which stands out as the region that is moving fastest on the decarbonisation trajectory.

THE FUTURE TRAJECTORY IS THREATENED

We have undertaken this assessment at a time when the global political and economic climate is undergoing significant change. The transition to the low carbon economy is unlikely to accelerate under the current U.S. administration. It is our view that the demand drivers for the real estate transition are more resilient than those in other parts of the economy; as the fundamental premise of improving the efficiency of buildings is uncontroversial and delivers positive financial outcomes for owners and occupiers alike. We have factored the challenges posed by the political climate into our current assessment, downgrading some indicators as a result. We will be tracking whether further challenges materialise as we continue to assess the pace of transition and these may result in future downgrading.

Potential challenges to monitor in the U.S.

1	**Investor appetite**	Political and societal pressure to move away from environmental, social and governance (ESG) could lead to investors further downgrading the importance of decarbonisation and backtracking on commitments
2	**Grid decarbonisation**	Policy push away from renewables, with a pause on federal funding programmes and increased support for domestic fossil fuels may stall grid decarbonisation. This could be compounded by increased cost of materials and technology due to tarrifs. Increases in energy demand could be met through thermal generation
3	**Supportive supply chain**	Uncertainty associated with restrictive tariffs and labour laws may lead to increased labour and material costs for construction, limiting the attractiveness of interventions
4	**Cheaper technology**	Tariffs and disruption to global trade could increase technology costs
5	**Tightening regulation**	The political environment means a federal policy push away from the low carbon transition. States may lose federal funding to support policies aimed at building efficiency. We may see increased legal challenges to city and state building performance standards
6	**Occupier demand**	Political backlash against ESG may lead to a pullback from corporate net zero carbon targets and less demand in the market

1 *Investor appetite: Investor allocations will be based on decarbonisation goals*

	Global	North America*	Europe	Asia Pacific
	 NEUTRAL	 NEUTRAL	 ACCELERANT	 NEUTRAL
Summary[2]	**69%** of investors consider/plan to consider net zero carbon in investment decisions Consistently mid to high levels indicate a 'strong' neutral in support of the transition	**50%** of investors consider/plan to consider net zero carbon in investment decisions Relatively lower levels and consistency leads to a neutral outlook	**80%** of investors consider/plan to consider net zero carbon in investment decisions Consistently high levels of consideration supports European investors being an accelerant	**73%** of investors consider/plan to consider net zero carbon in investment decisions Relatively high level of consideration but slight reduction in trend and high variability between countries in region. Overall rated as a neutral/borderline accelerant
Accelerating factors	Large scale investors with considerable AUM continue to allocate based on ESG factors	Even with a backlash against ESG, the fundamentals of protecting value and providing resilient investments for real estate persists	Early signs of investors 'doubling down' on commitments witnessed. Regulatory environment supportive of acceleration	National commitments and disclosures reflected in investment decision making
Potential challenges	Political and societal pressure to move away from ESG	Political and societal pressure to further move away from ESG	Leadership position comes under political and societal pressure to soften ambitions	Political and societal pressure to move away from ESG

* Canada and the United States are considered as 'North America' for this indicator. Indicator assesses investor appetite for net zero carbon and how this affects investment allocations.

RELEVANCY

Nuveen's recent survey of over 800 institutional investors representing $19 trillion of assets under management, found that almost seven out of 10 investors have or are considering net zero commitments (NZC) and a significant number have set interim goals out to 2025/2030.

Investors continuing to allocate capital to low and zero carbon products is essential in supporting the transition.

Despite the ongoing consideration of NZC in allocations, *investors do report seeing a slower pace to the energy transition than three years ago with 61% responding that they see the transition to a low carbon economy as inevitable, down from 79% in 2023.*

DRIVING FORCES

In recent history investors have increasingly considered ESG, climate risk and NZC factors in allocation decisions.

Investors continue to show consideration across ESG, climate risk and NZC factors, with 80%, 77% and 69% respectively reporting they consider or plan to consider these factors in their investment decisions.

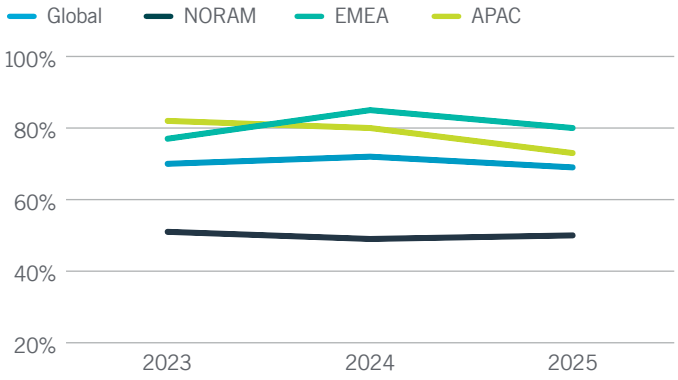
Regional variances are quite stark, with U.S. investors less likely to give weight to ESG, climate risk and NZC factors than their EMEA or APAC counterparts.

Larger investors (AUM over $10 billion) are considerably more likely to factor in NZC when making allocation decisions than smaller investors. Of the 439 investors with AUM above $10 billion, close to 75% either do take account of net zero carbon or are planning to in allocation decision making. This has remained largely unchanged over the past three years — showing the weight of global capital remains behind NZC.

The majority of investors in each region continue to favour ESG factors when considering investments.

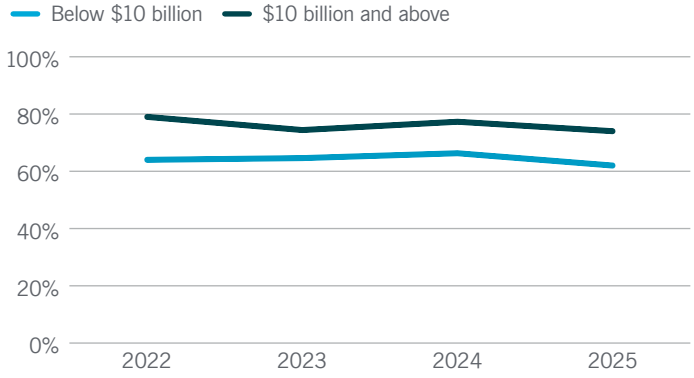
With the recent ESG backlash in certain markets, a softening investor base considering ESG factors can be seen, however the majority of investors in each region continue to favour ESG factors when considering investments. Close attention will be paid to this indicator moving forward. Recent reports from Europe and Asia Pacific indicate long-term investors continue to support ESG goals and are making allocation decisions away from managers seen to be rowing back on ESG commitments.

Figure 1: Investors who consider/plan to consider *net zero carbon* in investment decisions (by region)



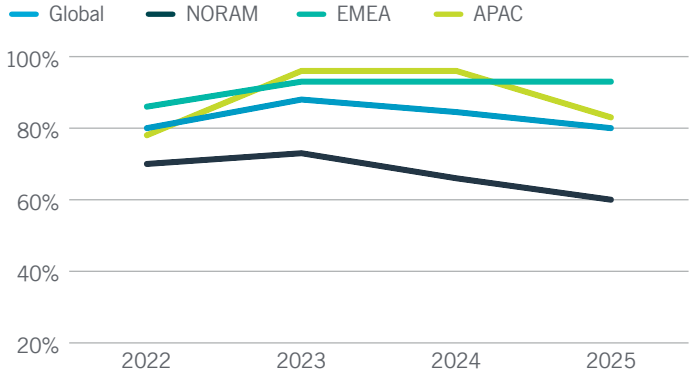
Source: Nuveen Equilibrium Global Institutional Investor Survey, 2025
Note NORAM = North America (USA and Canada)

Figure 2: Investors that do, or plan to, consider *net zero carbon* in investment decisions (by AUM)



Source: Nuveen Equilibrium Global Institutional Investor Survey, 2025
Note NORAM = North America

Figure 3: Investors who consider/plan to consider *ESG factors* in investment decisions (by region)



Source: Nuveen Equilibrium Global Institutional Investor Survey, 2025
Note NORAM = North America

2 *Grid decarbonisation: Electricity grids in specific regions will continue to decarbonise*

	Global	United States	Europe	Asia Pacific
	 NEUTRAL	 NEUTRAL	 ACCELERANT	 BOTTLENECK
Summary	**2023: 480 gCO2/kWh** (7% ↓ since 2020) Grids have decarbonised and will continue to do so, however global rate of decarbonisation lags target milestones	**2023: 370 gCO2/kWh** (35% ↓ since 2020) Considerable gains made since 2000. Announced pathways unlikely to deliver reductions necessary. Political headwinds expected	**2023: 300 gCO2/kWh** (30% ↓ since 2020) Lowest current intensity with pathways in place for majority of region to further improve	**2023: 589 gCO2/kWh** (6% ↓ since 2020) Highest current intensity with lowest reductions since 2000. Announced pathways unlikely to deliver reductions necessary
Accelerating factors	Net zero carbon policies and falling cost of renewables	Rising energy demand and corporate targets means continued investment in renewables to meet demand	Net zero carbon policies, falling cost of renewables and energy independence	Region invests heavily in renewable energy, potential to skip directly to renewables
Potential challenges	Increases in demand (AI, industrial policy etc.) may look to be met through thermal generation, setting back decarbonisation plans	Policy push away from renewables with pause on federal funding programmes and increased support for domestic fossil fuels. Increased cost of materials and technology due to tarrifs. Increases in energy demand could be met through thermal generation	Increases in demand (AI, industrial policy etc.) may be met through thermal generation, setting back decarbonisation plans	Need to build out infrastructure at pace and countries support for domestic fossil fuels

RELEVANCY

Real estate consumes approximately 55% of electricity produced globally and is forecast to increase with growing electrification and continued construction of new real estate stock.[3] Decarbonising how electricity is generated and transmitted is arguably the primary factor in real estate moving to a low carbon future. Measures to manage and reduce demand are of course important, as are moves to electrify heating and cooking however the scale of impact through decarbonising the grid cannot be overstated.

DRIVING FORCES

Global electricity grid carbon intensity has dropped 7% in the period of 2000 – 2023. The U.S. has led the way with a 35% reduction whilst Europe has cut 30%. Asia lags somewhat with a 6% reduction as demands in the region continue to be met in part by fossil fuel generation. These improvements are driven by several factors, the majority of which appear to have continued relevance leading to a positive outlook:

- National and local energy policies commitments have increased support for renewables. Renewables generated a record 30% of global electricity in 2023, driven by growth in solar and wind
- Energy commodity price shocks and national security concerns have led to a rise in renewables as nations look for energy independence and protection from energy price fluctuations. The megatrend towards decoupling looks set to continue
- The cost of low carbon generation has reduced, with the International Energy Agency (IEA) clean energy equipment index (tracking prices of solar PV modules, wind turbines, EV batteries and utility scale batteries) having fallen more

than 58% since 2013. Reducing cost of batteries will have a considerable impact on the ability of electricity grids to incorporate intermittency, further supporting additional renewable energy supplies. In the same period the technology has improved considerably

- A desire to control air pollution leading to policies reducing use of thermal generation

Across the regions in which we invest, Europe has the lowest carbon grids, with Asia having the most carbon intensive today.

U.S. grids have decarbonised considerably since 2000 with the retiring of coal-fired plants, however recent indications from the changing political environment would suggest pace may slow. Investors should monitor the impact of changes to the U.S. Inflation Reduction Act (IRA) and the Environmental Protection Agency (EPA) regulation of power plants on future U.S. grid decarbonisation.

Looking forward, the outlook for grid decarbonisation remains positive as renewables capacity accelerates and coal is phased out. Future forecasts indicate that several markets are well-positioned to transition or have already met global requirements. On the other hand, a number face a more complex transition due to factors including prevalence of domestic energy supplies, cost of transition and land constraints.

Grid decarbonisation outlook by market

Low carbon	Well positioned	Complex transition
Low grid carbon intensity at or on track to meet IEA targets	**Moderate grid carbon intensity with potential pathway to IEA targets**	**Less clean grids and markets with strong demand growth/powerful domestic fossil fuel industries**
United States Washington Denmark Finland France Norway Sweden Switzerland	United States California Florida Georgia New York North Carolina Tennessee Texas Virginia Germany Italy Spain United Kingdom New Zealand	United States Indiana West Virginia Poland Australia China India South Korea

Note: U.S. states selected as representative of U.S. markets

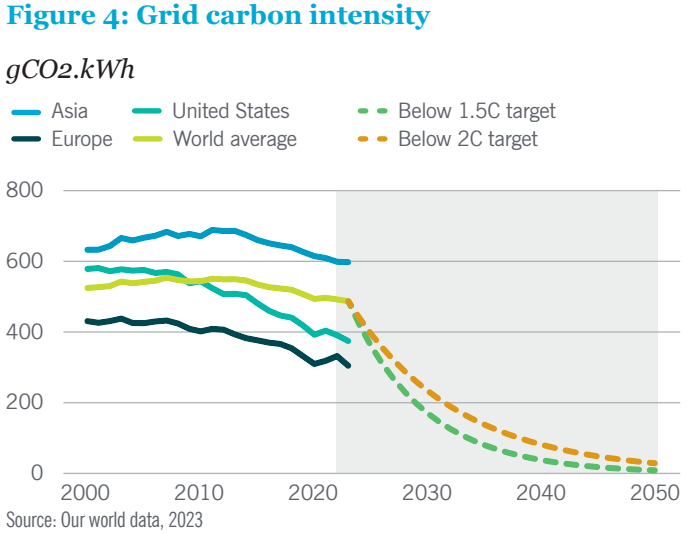
While the outlook is moving in a positive direction, the current rate of global electricity grid decarbonisation lags 1.5˚C and 2˚C scenario milestones, requiring power sector emissions to reduce to around 165 and 220 g CO2/kWh respectively by 2030 (representing a 66% reduction, or 14% annualised, from 480 gCO2/kWh in 2023).[4] This would require continued rapid expansion in low carbon generation and the phasing out of coal in generation from 36% in 2022 to 4% by 2030. The strength of fossil fuel lobbies is likely to create challenges along the path to decarbonisation.

REAL ESTATE INVESTMENT IMPLICATIONS

Investors committed to decarbonisation should consider investing in markets where the carbon intensity of electricity consumed is lower, or which have tangible grid decarbonisation pathways. Buildings located in low carbon intensity grids will ultimately be cheaper to transition to net zero carbon, as they will not need to reach the same low levels of energy intensity to achieve net zero carbon standard. Investors should monitor decarbonisation progress against stated plans, particularly considering increasing energy demands driven by AI.

We assess the global outlook for grid decarbonisation to be neutral. The global pace is not fast enough, but the markets we invest in have seen swifter decarbonisation than the global average and the lower cost of renewables is likely to drive continued progress.

Figure 4: Grid carbon intensity



Source: Our world data, 2023

3 Supportive supply chain: *Supply chain dynamics will support the energy transition*

	Global	United States	Europe	Asia Pacific
	BOTTLENECK	BOTTLENECK	BOTTLENECK	BOTTLENECK
Summary	Construction costs continue to track above inflation which leads to a bottleneck effect as necessary retrofits and building improvements become less commercially viable Lack of skills and costs of retrofitting buildings constrains the pace of transtion. Data indicates that the number of green jobs is growing but a faster transition is required. Construction costs remain elevated, fueled by skills shortages			
Accelerating factors	Growth in skills and green jobs has been considerable and is forecast to increase as strong demand persists. Global construction costs show signs of stabilising			
Potential challenges	Uncertainty associated with restrictive tariffs and labour laws may lead to increased labour and material costs for construction, limiting the attractiveness of interventions			

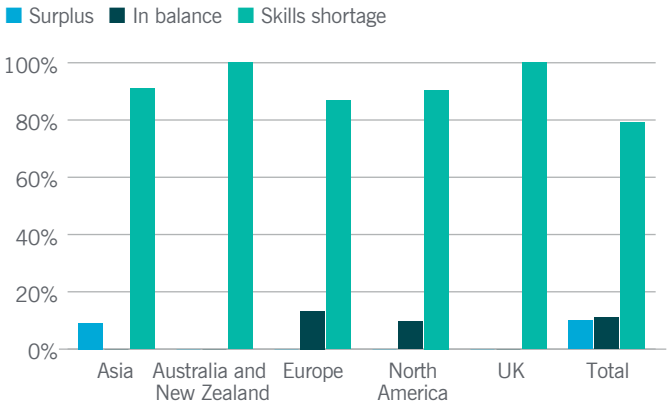
RELEVANCY

Real estate supply chains' ability to deliver on NZC is crucial to meeting ambitious targets. The growth of skills (i.e. green jobs) and construction costs are important indicators of overall progress – if skills are not available at scale and construction and retrofitting proves costly, transition progress will be constrained.

DRIVING FORCES

Globally, the construction industry faces a chronic skills gap, with 79% of contractors reporting a shortage. Spurred by the need for skilled labour, capacity constraints on materials and geopolitical uncertainty, construction costs continue to rise. In 2023, global construction costs rose 6.4%.

Figure 5: Availability of construction labour by region



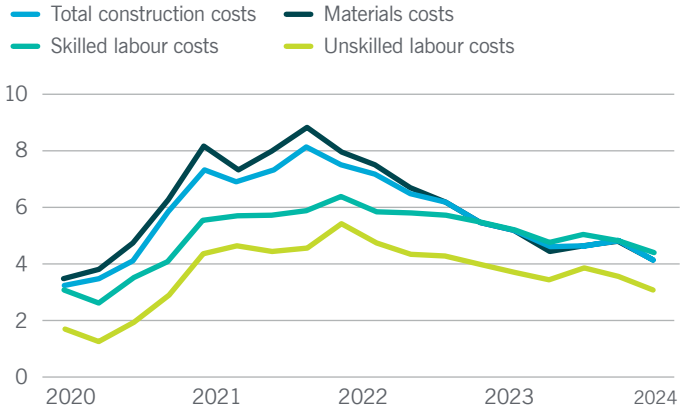
Source: Turner & Townsend, International construction market survey, 2024

Slowing construction cost rises appear to be on the horizon. RICS[5] forecast 2024 costs to stabilise between 4 – 6%. Even with this stabilisation, cost increases will remain above general inflation. Rising costs contribute to affordability challenges in retrofitting buildings, leading to difficulty in meeting building energy efficiency goals.

Around 80% of buildings in cities today will remain in 2050. To meet the transition, retrofitting of older stock must increase from around 1% to 3% annually, a considerable increase. Markets well positioned for retrofitting are those which face lower barriers to meet CRREM (Carbon Risk Real Estate Monitor) energy targets and lower costs of retrofitting. Typically, buildings located in markets with cleaner electricity grids have less stringent energy efficiency targets meaning the extent of retrofit, and therefore the cost, is less. Sector is an important factor, with offices typically more expensive to retrofit than retail and logistics.

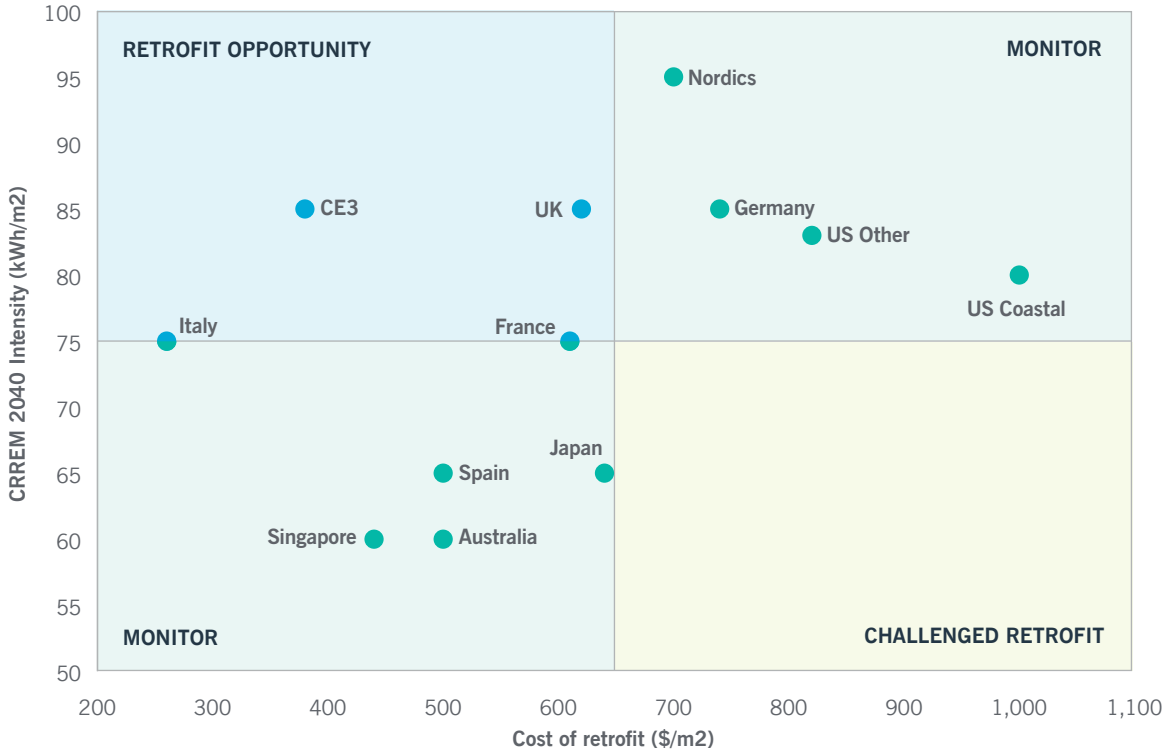
Figure 6: Global twelve-month cost projections

Annual % change expected



Source: RICS, Global Construction Monitor, Q3 2024

Figure 7: CRREM energy target vs. cost of retrofitting



Source: CREEM v2.0, PMA

4 *Cheaper technology: Technology to make buildings more energy efficient will continue to improve and reduce in cost*

	Global	United States	Europe	Asia Pacific
	 ACCELERANT	 ACCELERANT	 ACCELERANT	 ACCELERANT
Summary	Technology adopted in real estate tends to be region agnostic as core real estate markets utilise similar technologies Key technologies for the transition indicate positive improvements in efficacy and cost reductions leading to this indicator being an accelerant			
	EFFICIENT HVAC	**LED**	**HEAT PUMPS**	**BATTERY STORAGE**
Technology maturity	MATURE	MATURE	MATURING	DEVELOPING
Current state	Well established technologies at scale are available	Efficacy and adoption on-track to meet IEA targets	Well understood technology with widespread adoption Some barriers to implementation persist	Building scale battery storage is not widely adopted
Accelerating factors	Building performance standards continue to be introduced	Minimum energy performance standards continue to be introduced, sustaining demand and innovation	Desire for energy independence and obligations to meet national commitments	Supportive policies likely to drive further demand. Improvements in technology and cost likely from growth in electric vehicles
Potential challenges	Upfront costs, split-incentives, supply chain and installation tightness. Tariffs could increase costs in U.S.	Quality standards needed to ensure end-user satisfaction. Tariffs could increase costs in U.S.	Upfront costs, operating costs linked to electricity pricing, supply chain vulnerabilities and installation. Political environment has seen heat pump policy targeted in some countries. Tariffs could increase costs in U.S.	Upfront costs to install persist as a bottleneck. Tariffs could increase costs in U.S.

RELEVANCY

Reducing energy demand from existing and new buildings is key to the transition.

Operational energy use in buildings represents about 30% of global energy consumption, according to the IEA. Improvements in building technologies and operations have delivered a 14% reduction in energy intensity of buildings since 2010, this is key as global floor area continues to increase. To meet future projections, a further 44% reduction in energy intensity is required so continued innovation and cost reduction of technologies is paramount.

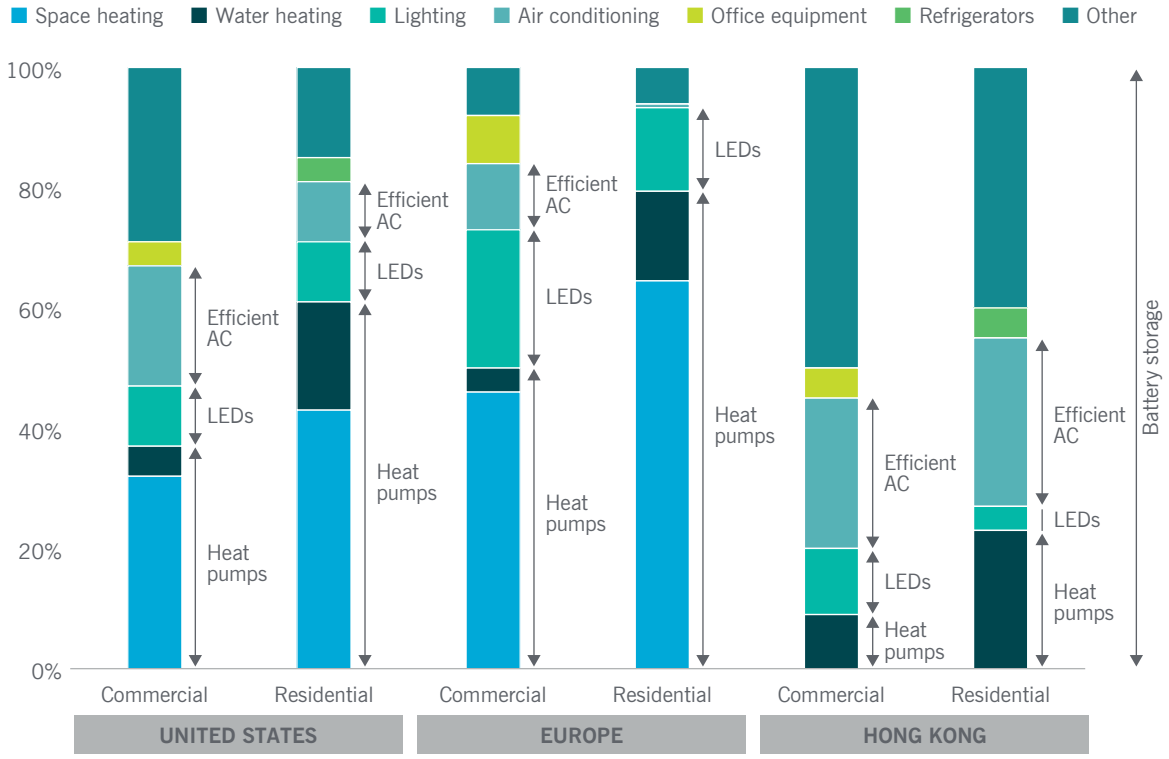
DRIVING FORCES

Strong demand for technologies to support reduced energy bills and carbon emissions will continue. The IEA forecasts that to meet net zero emissions by 2050, investments in building energy efficiency and electrification will increase 2.5x by 2030 when compared to 2023. This demand, bolstered by regulations at the building level to promote efficiency and improved performance (see regulation indicator) lead to cost efficiencies.

Most energy used in commercial and residential buildings globally goes towards space heating/ cooling, heating water and air-conditioning. Technologies which can increase efficiency and electrification of these are therefore critical, namely:

- **Heat pumps:** Supporting electrification by replacement of fossil fuel boilers whilst lowering energy demand (owing to the higher energy efficiency of heat pumps)
- **LED lighting:** Replacements to less efficient technologies reduce lighting demand
- **Efficient HVAC:** More efficient equipment such as pumps, fans, chillers etc. alongside building energy management systems have a considerable impact in improving efficiency
- **Batteries:** Supporting demand reduction through improved balancing of (renewable) energy supplies with demand

Figure 8: Typical energy end-use and potential for technology to impacts



Source: U.S. Energy Information Administration, Eurostat, Hong Kong Electrical Mechanical Services Department (EMSD)

Of the technologies identified, we have focussed on three to provide a snapshot on the progress of technology adoption, efficiency and costs:

Heat pumps

- Heat pumps are not a new technology, but efficiency improvements and policy drivers to decarbonise heating place them at the centre of the transition
- Heat pumps are forecast to make up almost 20% of heating demand by 2030 (up from 9% in 2021) while pricing is forecast to drop by 23% to 2030 and 25% by 2050 as supply chains adapt to meet demand

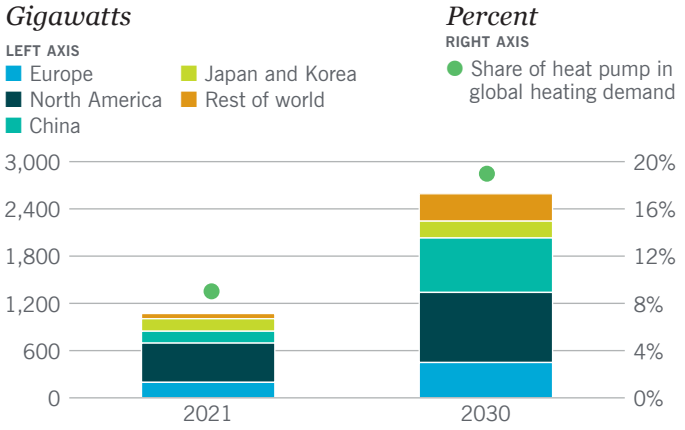
LED lighting

- LEDs are known for high efficacy and long life-span versus traditional lighting technologies. Adoption of LEDs surged in the early 2010's, driven by regulations, improved quality and falling costs
- The IEA net zero emissions by 2050 scenario (NZE scenario) calls for all lighting sold by 2025 to be LED, stressing the importance of the milestone alongside continued improvements
- Residential LED sales increased substantially in recent years, rising from around 5% of the market in 2013, to about 50% in 2022 and is forecast to continue
- Transitioning from traditional lighting technologies to LEDs is simple, typically not requiring extensive capex, which has supported its adoption

Battery storage behind-the-meter

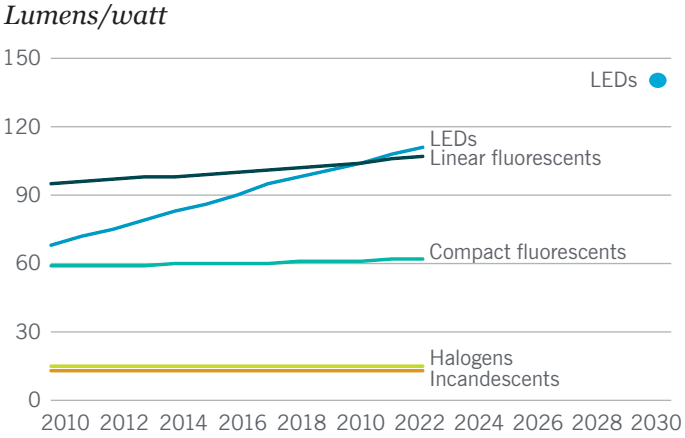
- Battery storage in buildings such as behind-the-meter (BTM) supports reduced electricity costs and demand on electricity networks. As electrification of buildings continues and more pressure is placed on electricity networks, the role of batteries to meet rising demand and the ability to store renewable energy is key
- Demand for BTM battery storage is forecast to increase by 6x in the period from 2023 – 2030 against the backdrop of broader penetration of battery technology

Figure 9: Heat pump capacity in buildings by country and region in the Announced Pledges Scenario



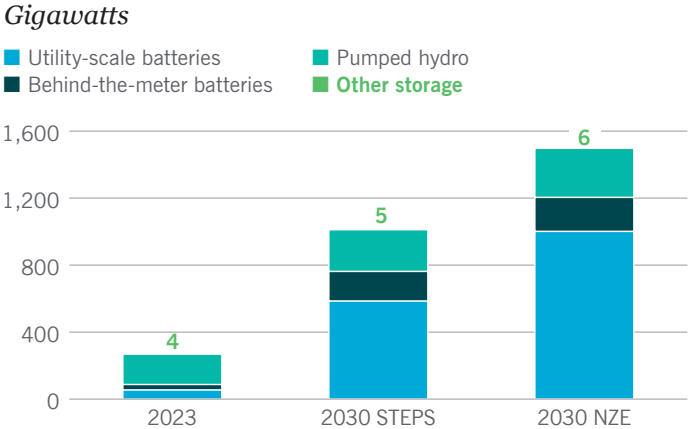
Source: IEA, the future of heat pumps 2023

Figure 10: Lighting efficacy by technology in the net zero scenario, 2010 – 2030



Source: IEA 2023, Lighting efficacy by technology in the net zero scenario, 2010 – 2030, IEA, Paris

Figure 11: Global installed energy storage capacity by scenario, 2023 and 2030



Source: IEA 2024, Global installed energy storage capacity by scenario, 2023 and 2030, IEA, Paris

Note: STEPS = States Policies Scenario; NZE = Net Zero Emissions by 2050 Scenario. Other storage includes compressed air energy storage, flywheel and thermal storage. Hydrogen electrolysers are not included.

While costs continue to fall for key technologies, challenges persist with implementation due to costs of installation, need for upfront capital and installer availability. A further consideration of electrification is the cost of electricity, which in some cases can be higher than using natural gas.

Real estate investment implications

Technological developments have a positive impact on real estate as costs to decarbonise come down while efficiencies increase, yielding more affordable capital works planning and increased Net Operating Income (NOI) from lower energy costs.

With the expected rise in adoption of building performance standards, pressure to decarbonise buildings will increase, meaning it is imperative that technologies be deployed at scale. Regulations aside, increased government support programmes in the form of subsidies and green loans could be introduced to support the development and adoption of technologies.

To overcome the challenge of high capital costs to upgrade buildings, it is likely that energy performance contracting will re-emerge as a viable option to minimise end-user capex while delivering improvements.

While the trend has been for significant cost reductions in these technologies up until now, disruption to global trade through tariffs could increase costs, particularly in the U.S.

5 *Tightening regulation: Building regulation around energy and carbon efficiency will strengthen*

	Global	United States	Europe	Asia Pacific
	 ACCELERANT	 NEUTRAL	 ACCELERANT	 ACCELERANT
Summary*	**Stringency Index** **Current: 6.0** **Future: 8.0 (+2)** Stringency forecast to tighten considerably Political uncertainty moving forward may lead to slowing	**Stringency Index** **Current: 4.8** **Future: 4.1 to 6.3 (-0.7 to +1.5)** Could be classed as an accelerant due to projected tightening of stringency and regulations already in place for 25% of US building stock. However, considerable risk to future regulation means a downgrade to neutral, with further downgrade possible.	**Stringency Index** **Current: 7.1** **Future: 9.5 (+2.4)** Stringency is high and forecast to further tighten Europe continues to lead on regulation on corporate disclosure and building level performance	**Stringency Index†** **Current: 4.8** **Future: 6.1 (+1.3)** Lower stringency today with tightening foreseen, political headwinds limited Closing the gap to Europe with pockets of leadership
Accelerating factors	Global recognition that building peformance standards are a crucial element of decarbonisation Regulations set to tighten	Certain states look to accelerate plans and differentiate	Potential introduction of country specific building performance standards	Countries pushing towards a tangible energy performance regime, recognising that buildings support lower demand for energy going forward
Potential challenges	Political and social environment causes reduction in ambition to reduce enegry consumption and emissions	Political environment means a federal policy push away from the low carbon transition. States may lose federal funding to support policies aimed at building efficiency. We may see increased legal challenges to city and stare building performance standards	The existing EPC regime lacks a link to actual energy performance which can lead to perverse incentives	Complexity in local markets, lack of political will to continue with low carbon agenda

* Stringency data derived from Property Market Analysis (PMA) Total regulatory index current and future 3Q 2024: which includes asset level requirements for NZC performance, financial reporting regulation and NZC strategy implementation. Values presented based on office sector, ex. China as representative

† Asia Pacific values exclude Mainland China due to lack of provider data

RELEVANCY

Since the 2015 Paris Accord, regulations supporting the low carbon transition have developed at pace with new disclosure, taxonomies, ratings and accounting standards introduced. For real estate, the key regulations are those relating to building level performance, where focus is placed on reducing energy consumption and carbon emissions.

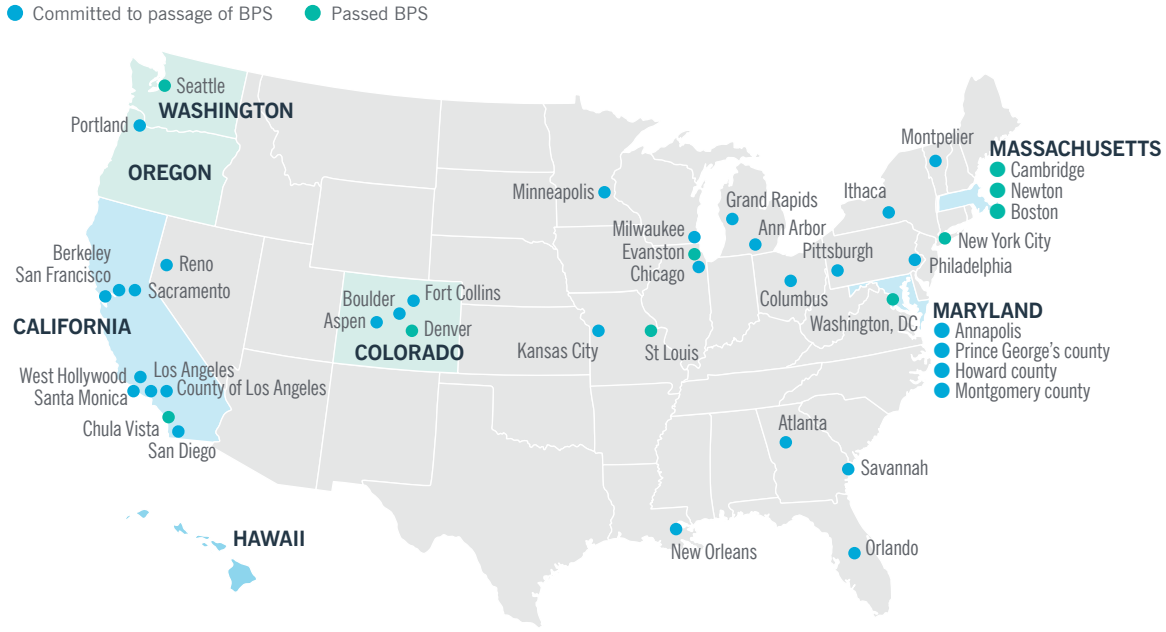
DRIVING FORCES

Europe will likely continue leading across the spectrum of regulation. At building level, EU NZC requirements are expected to tighten further, continuing to be the most stringent globally. A good example of European regulatory direction is France's Décret tertiaire which requires buildings to reduce energy consumption 40% by 2030, 50% by 2040 and 60% by 2050, compared to a 2010 baseline.

The recent EU omnibus signals a streamlining of some disclosure (Corporate Sustainability Reporting Directive) and carbon pricing standards (Carbon Border Adjustment Mechanism) as the bloc looks to reduce the burden of disclosure requirements while maintaining progress. Changes to current regulations have limited impact on real estate. Meanwhile, the Energy Performance of Buildings Directive (EPBD) is in the process of being recast and will include requirements for residential buildings to reduce average primary energy use by 16% by 2030, and 20 – 22% by 2035. Non-residential buildings will see the introduction of Minimum Energy Performance Standards to renovate the 16% worst-performing buildings by 2030 and the 26% worst-performing buildings by 2033.

Figure 12: The State of Building Performance Standards (BPS) in the U.S.

Members of the National BPS Coalition as of April 2025



Sources: Institute of Market Transformation and National BPS Coalition. Updated as of July 2024

The Asia Pacific region currently has lower stringency of regulation, however, it is moving towards alignment with Europe, particularly in markets where Nuveen invests. In recent years, APAC nations adopted considerable new regulations around disclosure, climate risk management and introduced numerous sub-regional and national taxonomies. Building level requirements were introduced in China, Japan, Korea and others. Providing leadership in the region is Singapore through the Green Plan 2030, and the Australian states.

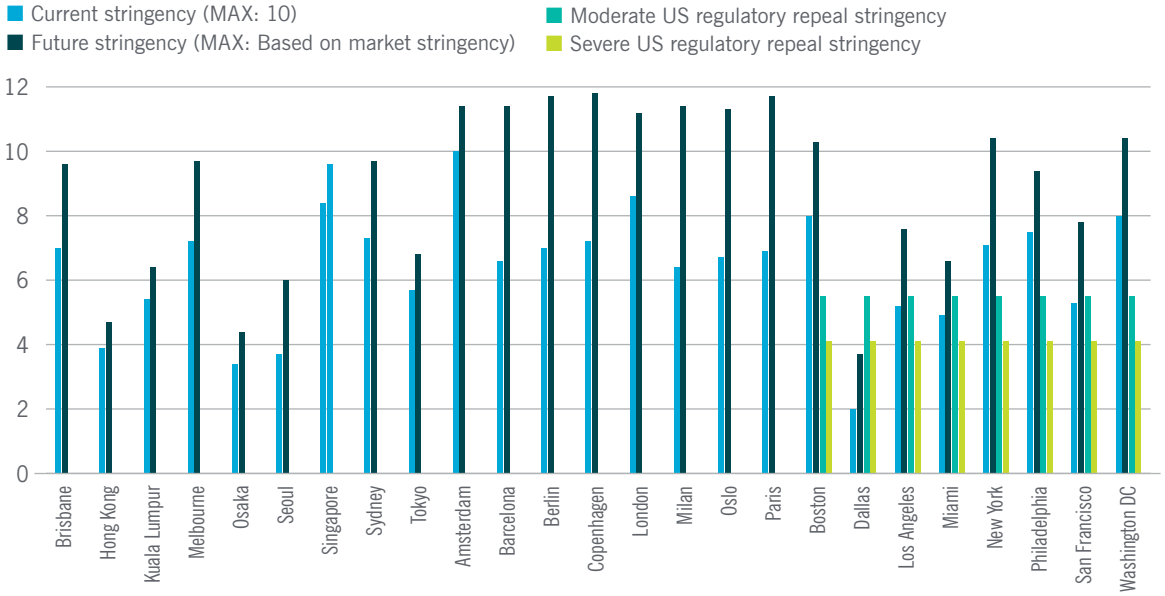
The outlook in the U.S. is complex. At a federal level it is unlikely that further regulation will be introduced. At city and state level it is more nuanced. Some states may step away from ESG regulation while others adopt a progressive stance. For example, over 40 jurisdictions, accounting for almost 25% of U.S. building stock, have joined the National Building Performance Standards Coalition[6] in committing to adopt building performance standards, furthermore:

- 50+ jurisdictions require owners to disclose energy use to city
- 24 governors representing 57% of the U.S. economy committed to Paris Accord objectives around reducing GHG emissions
- 24 states maintain clean energy goals
- 80+ jurisdictions require all-electric new build

Schemes such as Boston's BERDO (Building Emissions Reduction and Disclosure) and NYC's Local Law 97 have been enacted with considerable impact. These regulations are more effective drivers of energy efficiency than the European Energy Performance Certificate (EPC) approach as they are based on actual, measured energy performance.The chart below sets out the range of possible future regulatory stringency outcomes in the U.S., under different regulatory repeal scenarios.

Assessing the indicator globally today, we consider it to be an accelerant based upon a consideration of current and coming regulations at the building level. However, current and future commitments might not be met as political or economic pressures increase. This may be true of both voluntary commitments and legally required ratchets of building performance stringency. This indicator is therefore at risk of becoming a bottleneck, particularly in the U.S.

Figure 13: Regulatory stringency, current vs. future



Includes asset level requirements for NZC, financial reporting regulation and NZC strategy implementation requirements

Source: PMA NZC Global Regulations Stringency Index, Q1 2025

Note: **Moderate & Severe** regulatory repeal refers to PMA analysis of future scenarios for the US under the current administration.

Moderate - PMA shows what impact failure to enforce or indeed the successful repeal of financial disclosure legislation has on the US's stringency ranking. Though the absolute score still shows an increase due to the planned heightening of building performance standards at the local level, there is a marked widening of the gap between the US and Europe.

Severe – Assumes recently announced Executive Order entitled Protecting American Energy from State Overreach is successful in its aim of dismantling state and local laws related to climate change and carbon emissions. Such an outcome would have far-reaching consequences for US building standards, effectively reversing what was once thought to be a one-directional shift towards tighter energy efficiency credentials.

6 *Occupier demand: Occupiers' net zero carbon goals will inform their space requirements*

	Global	United States	Europe	Asia Pacific
	NEUTRAL	NEUTRAL	NEUTRAL	NEUTRAL
Summary	**>7,000 entities have signed up to the Science Based Targets Initiative (SBTi), representing 40% of global market capitalisation** Tracking SBTi signatories offers an indication of occupier demand. Anecdotal evidence indicates potential headwinds for growth of signatories in future years With 40% of market cap and an uncertain outlook, occupier demand informing space requirements is considered to be neutral globally. Should the number of signatories/market capitalisation continue to increase there is potential to move to an accelerant NZC targets commonplace for corporate occupiers today. Corporate requirements for sustainability typically focus on green building certification. Evidence is emerging of green premiums in certain locations and sectors			
Accelerating factors	Corporate NZC commitments made publicly, continued pressure from staff to maintain elements of sustainability and growing regulatory requirements around disclosure of environmental performance			
Potential challenges	Backlash against ESG may lead to pullback from corporate NZC targets and less demand in the market			

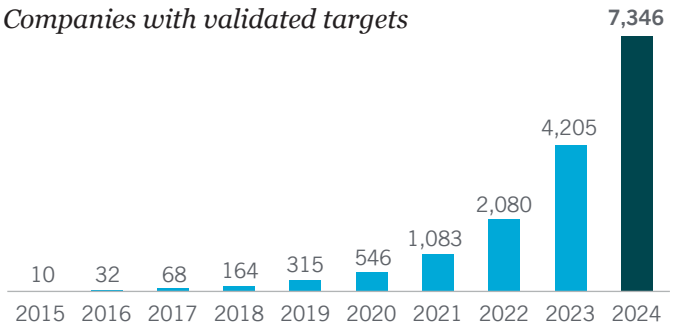
RELEVANCY

Strong occupier demand is a crucial factor in decarbonising buildings. While some investments in energy efficiency improvements can be justified purely in terms of energy cost savings, the cost of the deeper retrofits necessary to deliver net zero carbon buildings can only be justified when a value gap between 'green' and 'brown' buildings exists. Recent studies indicate occupiers are seeking landlords with clear plans on energy intensity, electrification and sourcing clean electricity alongside a willingness to work collaboratively on decarbonisation pathways.

DRIVING FORCES

A combination of consumer preference, employee pressure and regulatory factors are driving corporations to set decarbonisation goals. For occupiers, regulation relating to the low carbon transition is felt at the corporate level with increasing requirements for disclosures. For many organisations, energy consumption in their corporate real estate is a material source of carbon emissions.

Figure 14: Science based targets initiative aligned companies



Source: SBTI 2023, SBTi Monitoring Report 2023

In 2024, more than 7,300 companies representing over 40% of global market capitalisation had an approved Science Based Target in place. The number of signatories has risen exponentially since the introduction of the SBTi.

Under the 2016 – 2020 U.S. administration the number of corporates with a Science Based Target increased 14x even with similar themes to today. We are unlikely to see similar exponential growth this time around, however it is unlikely that corporates will walk away from their commitments en masse.

This growth in occupier demand is being met by a limited supply of suitable assets. Recent data suggests a 70% supply shortfall in low carbon office buildings out to 2030 with the U.S. showing a 75% unmet demand. Industrial and logistics shows a similar trend with an estimated 41% supply shortfall for the sector globally.[7]

The supply/demand dislocation can be seen to produce rental premiums in certain markets where data indicates premiums of 5 – 10% are possible. Data on rental differential related to sustainability is most readily available for the office sector and the corporate demand drivers set out above are less relevant to some other real estate sectors, such as residential. However, the reduction of energy bills that should result from efficiency investments is likely to be well received by residential occupiers and recent studies have started to see some evidence:

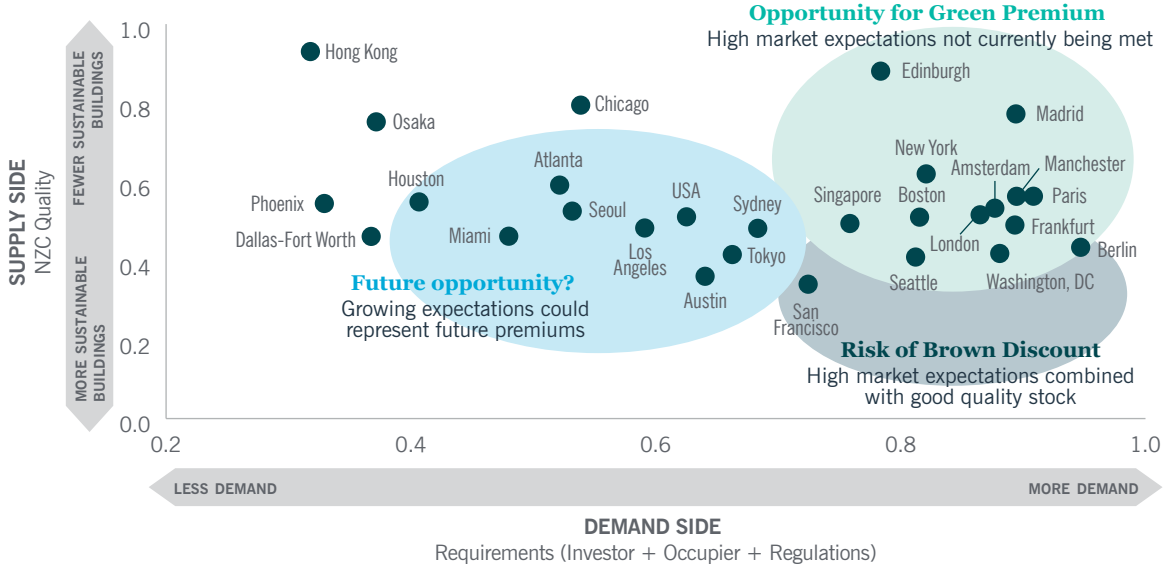
- According to a recent study by the National Multifamily Housing Council, 84% of millennials and 74% of baby boomers consider sustainability a crucial factor when choosing a rental property
- A 2022 PREA report found that the residential sector can see a 5 – 15% rental premium in buildings with green characteristics

Corporations maintain strong sustainability focus

- Nearly 70% of the planet's 500 largest companies now have public climate commitments
- Over 700 of the largest 2,000 publicly traded companies have made net zero commitments
- Two-thirds of the S&P 500 have set emission reduction targets of some kind
- Worldwide, 98% of companies reported some level of detail on sustainability in 2022

Over time we have observed a stronger integration between corporate sustainability teams and corporate real estate teams, leading to increased requirements for buildings with sustainability certification. However, outside larger, more ambitious corporations, there is little specificity of requirements that will effectively drive decarbonisation, such as low energy use intensity, electrification and low embodied carbon.

Figure 15: Markets with supply/demand dislocation opportunities



Source: PMA, 2024

REAL ESTATE INVESTMENT IMPLICATIONS

Occupier demand is likely to remain sticky, therefore it is important to assess portfolios and investments for alignment with occupier goals.

When considering allocations, there are opportunities where a supply/demand imbalance exists. Analysis shows that cities such as Edinburgh, Madrid, New York and Sydney exhibit the fundamentals required to support green premiums. Alternatively, markets oversupplied with green buildings while facing lower tenant demand, such as San Francisco, are likely to see the emergence of brown discounts. Well informed investors will be able to take advantage of potential brown discounts, identifying opportunities to access discounted assets and create upside.

CONCLUSION

Has the energy transition megatrend moved from accelerant to disruption?

In 2024, we released research exploring how the Megatrends shaping real assets investment activity have been accelerated or disrupted over the past decade. The energy transition stood out as a trend accelerated by technological advancements that have reduced the cost and increased availability of renewable energy. This has been compounded by a growing focus on sustainable development from corporations and investors.

As discussed in this paper, the core drivers supporting the transition of the built environment remain. Technological progress and regulatory tightening are still acting as strong accelerants. However, headwinds are building and the transition is showing some signs of disruption, particularly in the U.S.

The megatrends are interlinked and have the potential to support and disrupt each other. Technological advancement, digitalization and protectionism have featured particularly strongly in this paper, but all of the megatrends will have an impact on the pace of the energy transition.

How these megatrends interact with one another will be a key factor in the future pace of the transition, however, this interactivity is unpredictable. Tracking the effects on the energy transition will allow for a pragmatic assessment of its pace, allowing investors to position portfolios for today and the future.

MEGATREND	ACCELERATION OF ENERGY TRANSITION	DISRUPTION OF ENERGY TRANSITION
Digitalization: AI delivers transformative change	New affordable technologies enable decarbonisation	Growth of AI drives massive demand for energy
Rising inequality: despite the growth of the middle classes	Energy transition has the potential to deliver stability and reductions in energy prices and the growth of new industries and jobs	The challenge to traditional industries could exacerbate inequality and create opposition if not well managed
Continued growth of the South and East	Asian economies focus economic growth on the manufacture of PV panels, batteries and electric vehicles	The Asia Pacific electricity grids have shown much slower decarbonisation that Europe or the U.S. and face challenges to decarbonise further
Urbanisation adapts with growing mobility	New developments and redevelopments present opportunities to deliver high efficiency buildings	Development activity is highly carbon intensive, with the embodied carbon in a new development typically equivalent to over 50 years of operational carbon emissions
Globalisation disrupted: trade protection and sanctions drive decoupling	A prioritisation of local supply chains could bring more carbon efficiency	Tariffs could increase the cost of technologies essential for the energy transition such as batteries and solar PV panels
Climate change and nature loss materialise	Increasing climate disasters will focus government attention on accelerating the energy transition to alleviate negative impacts	Investment activity could shift to adapting to a changing climate at the expense of mitigation
Aging population boosts demand for alternatives	Limited impact	The cost of caring for an aging population could compete against the energy transition for government resource

For more information, please visit nuveen.com/realestate

Endnotes

Sources

1 UNEPFI and Global Alliance for Buildings and Construction: Global Status Report for Buildings and Construction 2024/25

2 Nuveen, Equilibrium 2025 Global Institutional Investor Survey

3 UNEP 2020 Global Status Report for Buildings and Construction

4 IEA, Electricity, https://www.iea.org/energy-system/electricity

5 RICS, Global Construction Monitor, Q3 2024

6 A voluntary group of states and cities launched in 2022 with a commitment to building performance policies and programs

7 JLL, Powering operational excellence, February, 2025

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